CHROMOSOME NUMBERS IN COMPOSITAE. XI. PERUVIAN SPECIES[1]

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ABSTRACT

Chromosome counts are reported for 60 collections of Peruvian *Compositae* representing 59 species in 31 genera. Most of these are first reports for a taxon concerned, including the genera *Ascidiogyne* ($n = 10$), *Diplostephium* ($n = 9$), *Oriotrophium* ($n = 9$), *Achyrocline* ($n =$ ca 14), *Gynoxys* ($n = 40$), *Loricaria* ($n =$ ca 14), *Monopholis* (n = ca 30) and *Pappobolus* ($n = 17$). Supernumerary or "B" chromosomes have been found in *Baccharis and Monopholis,* and an unusual aneuploid series has been detected in *Liabum* ($x = 9, 12, 14,$ and ca 18).

Chromosome counts for 60 collections of Peruvian *Compositae* are presented in Table 1. Bud material was collected in the field by Dr. John Wurdack and airmailed to the senior author in Austin, Texas, where the counts were made by the usual squash techniques (Turner & Johnston, 1959). Since most of these collections were from remote areas, it was often several weeks before the fixed material could be mailed. These delays and the high temperatures to which the meiotic material was exposed probably account for the numerous approximate counts reported in this paper. (Label-data on the voucher specimens—deposited TEX, US—give approximate counts, plus or minus 1 or 2 chromosomes; in Table 1 we have listed all such counts as approximations only.) Identifications were made by J. Cuatrecasas except for those of *Bidens* and *Coreopsis* (by the late E. E. Sherff), *Hypochaeris* (by A. L. Cabrera) and *Liabum rugosum* (by R. Ferreyra); chromosome counts were made by Powell and Turner, either singly or in combination.

RESULTS AND DISCUSSION

VERNONIEAE—*Vernonia baccharoides* ($n =$ ca 17) and *V. pacchensis* ($n =$ ca 8): Hunter (1964) reported several species of the sect. *Lepidoploa* of *Vernonia* with chromosome numbers of $n = 17$. Jones & Duncan (1966), however, reported chromosome numbers of $n = 18$ for numerous species, including at least three of the taxa investigated by Hunter. Unfortunately the meiotic figures from which our counts were made were not sufficiently clear to allow unequivocal counts, although the approximate counts are believed to be accurate within one chromosome pair.

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Table 1. *Compositae* of Peru (Departmento Amazonas) examined for chromosome number.

Species	Locality and Voucher	*n* Number[a]	
TRIBE VERNONIEAE			
Vernonia baccharoides H.B.K.	Prov Bagua, *Wurdack 1812*	17	
Vernonia pacchensis var. *tambillensis* Hieron.	Prov Chachapoyas, *Wurdack 715*	ca 8	
TRIBE EUPATORIEAE			
Ageratum latifolium Cav.	Prov Chachapoyas, *Wurdack 443*	20	
Ascidiogyne wurdackii Cuatr.	Prov Chachapoyas, *Wurdack 1716*	10	
Ascidiogyne wurdackii Cuatr.	Prov Chachapoyas, *Wurdack 1246*	ca 10	
Mikania speciosa DC.	Prov Chachapoyas, *Wurdack 770*	ca 16	
Mikania violaefolia Cuatr.	Prov Chachapoyas, *Wurdack 1257*	ca 18	
Eupatorium pseudarboreum Hieron.	Prov Chachapoyas, *Wurdack 468*	10	
Eupatorium ivaefolium var. *hirsutum* Hass.	Prov Chachapoyas, *Wurdack* 647	50	I
Eupatorium macrophyllum L.	Prov Bagua, *Wurdack 1815*	10	
Eupatorium ventillanum Cuatr.	Prov Chachapoyas, *Wurdack 1476*	ca 17	
Eupatorium weberbaueri Hieron.	Prov Bongará, *Wurdack 988*	10	
Stevia andina Rob.	Prov Chachapoyas, *Wurdack 417*	ca 22	
Stevia rhombifolia H.B.K. var *stephanocoma* Sch. Bip.	Prov Chachapoyas, *Wurdack 445*	ca 46	I
TRIBE ASTEREAE			
Baccharis chachapoyasensis Cuatr.	Prov Chachapoyas, *Wurdack* 597	ca 9	
Baccharis chilco H.B.K.	Prov Chachapoyas, *Wurdack 496*	9	
Baccharis decussata (Klatt) Hieron.	Prov Bongará, *Wurdack 836*	9[b]	(Fig. 1)
Baccharis genistelloides (Lam.) Pers.	Prov Chachapoyas, *Wurdack 498*	9	
Baccharis grandicapitulata Hieron.	Prov Chachapoyas, *Wurdack 664*	9	
Baccharis latifolia (R. & P.) Pers.	Prov Chachapoyas, *Wurdack 455*	ca 18	
Baccharis oblongifolia (R. & P.) Pers.	Prov Chachapoyas, *Wurdack 1645*	9	
Baccharis phylicoides H.B.K.	Prov Chachapoyas *Wurdack 548*	ca 9	
Baccharis spathulata Klatt	Prov Chachapoyas, *Wurdack 1377*	9	
Baccharis tricuneata fma. *callaensis* Cuatr.	Prov Chachapoyas, *Wurdack 1706*	10	?
Diplostephium konotrichum Cuat.	Prov Chachapoyas, *Wurdack 1634*	9	
Diplostephium wurdackii Cuatr.	Prov Chachapoyas, *Wurdack 1672*	9	(Fig. 2)
Erigeron lanceolatus Wedd. var. *subacaule* Wedd.	Prov Chachapoyas, *Wurdack 792*	27	
Oritrophium aciculifolium Cuatr.	Prov Chachapoyas, *Wurdack 1275*	9	(Fig. 3)
TRIBE INULEAE			
Achyrocline alata (H.B.K.) DC.	Prov Chachapoyas, *Wurdack 726*	ca 14	
Gnaphalium spicatum Lam.	Prov Chachapoyas, *Wurdack 1699*	14	
Loricaria thuyoides (Lam.) Sch. Bip. var. *thuyoides*	Prov Chachapoyas, *Wurdack 1188*	ca 14	
TRIBE HELIANTHEAE			
Bidens pilosa var. *calcicola* (Greenm.) Sherff	Prov Chachapoyas, *Wurdack 444*	ca 24	
Bidens laevis (L.) B.S.P.	Prov Bongará, *Wurdack 892*	12	
Bidens triplinervia var. *mollis* (P. & E.) Sherff	Prov Chachapoyas, *Wurdack 488*	12	
Calea jelskii Hieron.	Prov Chachapoyas, *Wurdack 712*	19	(Fig. 4)
Coreopsis microlepis Blake & Sherff	Prov Chachapoyas, *Wurdack 472*	13	
Franseria artemisioides Wedd.	Prov Chachapoyas, *Wurdack 442*	ca 18	
Jaegeria hirta (Lag.) Less.	Prov Chachapoyas, *Wurdack 435*	ca 18	
Monopholis jelskii (Hieron.) Blake	Prov Chachapoyas, *Wurdack 452*	ca 30[b]	(Fig. 5)
Pappobolus woodsonianus Cuatr.	Prov Chachapoyas, *Wurdack 584*	17	
Siegesbeckia mandonii Sch. Bip.	Prov Bongará, *Wurdack 1009*	ca 30	
Spilanthes americana (Mutis) Hieron.	Prov Chachapoyas, *Wurdack 416*	ca 26	
Viguiera brittonii Hochreut.	Prov Chachapoyas, *Wurdack 414*	ca 34	
Wedelia helianthoides H.B.K.	Prov Chachapoyas, *Wurdack 448*	ca 20	
TRIBE SENECIONEAE			
Gynoxys parvifolia Cuatr.	Prov Chachapoyas, *Wurdack 1702*	ca 40	
Gynoxys tomentosissima Cuatr.	Prov Chachapoyas, *Wurdack 1254*	40[b]	
Liabum bullatum (Gray) Hieron.	Prov Chachapoyas *Wurdack 1240*	9	

Table 1. (*Cont.*)

Species	Locality and Voucher	*n* Number[a]	
Liabum hieracioides (H.B.K.) Less.	Prov Chachapoyas, *Wurdack 793*	12	(Fig. 6)
Liabum rugosum Ferreyra	Prov Chachapoyas, *Wurdack 469*	ca 18	
Schistocarpha oppositifolia (Ktze.) Rydb.	Prov Bagua, *Wurdack 1814*	ca 8	
Schistocarpha sinforosii Cuatr. fma.	Prov Chachapoyas, *Wurdack 796*	8	
Senecio coymolachensis Cabrera	Prov Chachapoyas, *Wurdack 1559*	20	
Senecio jalcanus Cuatr.	Prov Chachapoyas, *Wurdack 1375*	50	
Senecio loeseneri Hieron.	Prov Chachapoyas, *Wurdack 802*	20	
Senecio pleniauritus Cuatr.	Prov Chachapoyas, *Wurdack 1669*	ca 40	
Senecio verticillatus Klatt var. *trichophorus* Greenm.	Prov Chachapoyas, *Wurdack 799*	ca 45	
Senecio wurdackii Cuatr.	Prov Chachapoyas, *Wurdack 1599*	ca 40	
Werneria stuebelii Hieron.	Prov Chachapoyas, *Wurdack 1551*	50	(Fig. 7)
TRIBE MUTISIEAE			
Mutisia wurdackii Cabrera	Prov Bongará, *Wurdack 840*	ca 23	
TRIBE CICHORIEAE			
Hypochaeris sessilifolia H.B.K. vel sp. nov. *affinis*	Prov Chachapoyas, *Wurdack 437*	6	

[a] Unless indicated to the contrary the numbers listed refer to chromosome *pairs;* univalents are indicated by the Roman numeral I.

[b] Indicates that "B" chromosomes and/or fragments were observed.

EUPATORIEAE—*Ascidiogyne* ($n = 10$), is a recently described genus belonging to the subtribe *Piquerinae* (Cuatrecasas, 1965). *Piqueria* itself is at least tribasic, possessing species with haploid numbers of 10, 11 and 12 (Cave 1956-64). The only other genus of *Piquerinae* for which counts are available is *Adenostemma* with $x = 5$ (Turner & Irwin, 1960). The tribe *Eupatorieae* contains approximately 40 genera; counts are available for only 10, establishing *n* numbers of 4, 5, 9, 10, 11, 12, 15, 17, 18, 19. The most frequently encountered base number is $x = 10$ (6 genera), this being found in all three subtribes of the *Eupatorieae.*

Chromosome counts for the genera *Ageratum* ($x = 10$), *Eupatorium* ($x = 10, 17$), and *Stevia* ($x = 11, 17$) are consistent with base numbers already established for these genera (Cave, 1956-64). The approximate count for *Stevia rhombifolia* var. *stephanocoma* ($n = 46$ univalents) is interesting in that Powell & Turner (1963) report a number of $n = 34$ univalents for collections of this species from Mexico. Univalents in meiotic material are also found in species possessing base numbers of $x = 11$ (Turner & Flyr, 1966); thus it is difficult to evaluate the approximate count of 46 univalents listed for the South American collections of *S. rhombifolia,* although $n = 51$ univalents would appear to be the most logical interpretation as to its correct number, if the relationship of the varietal taxon is correct.

ASTEREAE—*Baccharis* ($x = 9$) is a large shrubby genus with several hundred species. Including the 10 species listed in Table 1, chromosome counts are now available for about 30 species. All counts have been diploid ($n = 9$) with the exception of *B. latifolia* ($n =$ ca 18, Table 1). *Baccharis tricuneata* is listed here

as having a questionable count of $n = 10$; while the meiotic plate seemed unequivocal it is possible that a supernumerary or "B" chromosome was mistaken as a bivalent. Such chromosomes are found in *Baccharis*, for *B. decussata* possesses 9 large, dark-staining bivalents and 4 smaller, heterochromatic "B" chromosomes (Fig. 1).

Chromosome counts for *Diplostephium* ($n = 9$) and *Oritrophium* ($n = 9$) are first reports. The latter is often included in *Erigeron* as a section but chromosomally (by its very large bivalents) and morphologically it seems sufficiently distinct to warrant generic rank.

INULEAE—*Achyrocline* ($n =$ ca 14), *Gnaphalium* ($n = 14$) and *Loricaria* ($n =$ ca 14) belong to the subtribe *Filagininae*, the genera of which are mostly $x = 7$. While the latter number is relatively common in this tribe, recent sampling from Australia, where the *Inuleae* are perhaps best developed, has revealed a considerable range of base numbers, from $x = 3$ to $x = 14$ (Turner, unpublished).

HELIANTHEAE—Chromosome counts for species of *Bidens* ($n = 12$, ca 24), *Calea* ($n = 19$), *Coreopsis* ($n =$ ca 30), *Franseria* ($n =$ ca 18), *Jaegeria* ($n =$ ca 18), *Siegesbeckia* ($n =$ ca 30), *Spilanthes* ($n =$ ca 26), *Viguiera* ($n =$ ca 34) and *Wedelia* ($n =$ ca 20) are consistent with the base numbers reported for these genera by earlier workers. It should be noted that the base number for *Spilanthes*, as established by Turner et al. (cf. Cave, 1956-64), appears to be $x = 13$. However, Cave (1964) lists a count for *Spilanthes acumella* as $n = 7$, although Mehra et al. (1965) report the species to have $n = 12$. The photograph of meiotic material which accompanied the latter report is not particularly convincing since at least some of the chromosomes which they picture seem to be clumped; consequently we prefer to accept the monobasic number $x = 13$ until more convincing documentation is forthcoming.

Pappobolus woodsonianus ($n = 17$) is a recently described species (Cuatrecasas, 1965) belonging to the subtribe *Verbesininae*. It has been compared to species belonging to *Helianthus*, a genus which also possesses species with a base of $x = 17$.

Monopholis ($n =$ ca 30), according to Blake (1922), is related to both *Verbesina* and *Monactis*, but perhaps closer to the latter. Chromosomally, *Monopholis jelskii* is distinguished by its relatively large bivalents and "B" chromosomes (Fig. 5). *Monactis* has not been examined but *Verbesina* (15 or more species investigated) is at least tribasic with $x = 16$, 17 and 18 while "B" chromosomes are unreported (Turner, Beaman & Rock, 1961; Turner & Flyr, 1966).

SENECIONEAE—*Gynoxys* with diploid chromosome numbers of 80 or near 80 appears to have a base of $x = 10$, although seemingly unequivocal counts were obtained from only one of the three species examined (Table 1).

Liabum (sensu lato) is a heterogenous group, the included species showing markedly different involucral types (uni- to multiseriate) and habits (small herbs to shrubs). Chromosomally the genus is also heterogeneous, for we have obtained

Fig. 1-7. Camera lucida drawings of meiotic chromosomes × 2700. Fig. 1. *Baccharis decussata* ($n = 9$), note the 4 supernumerary chromosomes (stippled). Fig. 2. *Diplostephium wurdackii* ($n = 9$). Fig. 3. *Oritrophium aciculifolium* ($n = 9$). Fig. 4. *Calea jelskii* ($n = 19$). Fig. 5. *Monopholis jelskii* ($n =$ ca 30), note the 8 or 9 supernumerary chromosomes (stippled). Fig. 6. *Liabum hieracioides* ($n = 12$), note the unusually large bivalent. Fig. 7. *Werneria stuebellii* ($n = 50$).

counts of $n = 9$, 12 and ca 18 for the three species listed in Table 1. The only previous count has been that of Diers (1961) who reported $2n = 28$ for *Liabum ovatum*. The chromosomes of *L. hieracioides* ($n = 12$) were especially interesting in that one very large bivalent, 3 to 5 times larger than the others, was seen consistently at metaphase I of meiosis (Fig. 6). The chromosomal data, scant as these are, would appear to justify the treatment of at least some of Bentham's sections (1873) as genera, for the several taxa we have examined belong to different subgeneric groupings.

Werneria stuebelii ($n = 50$) is the second report of an established count for this genus; Beaman & Turner (1962) having reported a count of $n = 50$ for *W. nubigena*. The only other counts have been those of Diers (1961) who reported a range of approximate counts for *Werneria* spp. (n = ca 21, 50, 52, 53, 54, 75, 77, 103, 106) and that of Heiser (1963) who reported a count of n = ca 48 for *W. nubigena*. Apparently the genus has a base number of $x = 25$ from an ancestral base of $x = 5$ (Turner & Lewis, 1965).

Chromosome numbers for *Schistocarpa* ($n = 8$) and *Senecio* ($n = 20$, ca 45, 50) are consistent with the base numbers established for these genera by several workers (Cave, 1964; Turner & Lewis, 1965; Ornduff et al., 1967).

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